The gas issues also with a strong pressure. The amount of water in the well does not affect the flow of gas in any manner.

Whatever the cause of the intermittent action it is influenced by the varying pressure of the air, for before a storm, when the barometer is falling, the gas continues to issue for a much longer period, sometimes for 24 hours; and when the rise in the barometer takes place there is the same prolongation of the period of inhalation. During high barometric conditions the equilibrium may continue for some time. The well at the present time produces four to five thousand gallons of water per month, being pumped on an average about every two weeks. The locality is about twelve miles from the sea in a direct line, and has an elevation of 1,300 feet, so that it would seem impossible that tidal action could have anything to do with the phenomenon. During a talk with Mr. Benton, the superintendent of the ranch, who has closely watched the well, he stated that he had noticed no connection between the respiration and any physical conditions save the one referred to. The gas is used in all the ranch buildings, but is of such a character that with the ordinary burner it does not give a good light, consequently an incandescent burner is used.

The question of the source of the gas is rather a puzzling one. It hardly seems possible that it can be derived from the strata penetrated, and if not it must have its source in the surrounding Cretaceous shales, or possibly in the white Miocene shales, which here, as nearly everywhere else, are filled with animal remains. A well was sunk to a depth of 900 feet in the same area of Cretaceous shales about two miles miles to the west, but without encountering water or gas. If derived from the Miocene shales the gas must circulate through the rock for nearly three-fourths of a mile at least. The water is very pure, containing no alkali or trace of oil such as might be expected if it has passed through Miocene strata.

As to the cause of the intermittent action no reasonable explanation has occurred to the writer, and it is left for physicists to explain. It is certainly not due to any of the connections on the surface, for the facts stated were observed prior to such connections.

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SOURCE OF X-RAYS.

Notwithstanding the considerable amount of attention the subject of Röntgen's discovery has received, there is a very wide diversity of opinion concerning the part of the vacuum tube at which they are produced. In view of the high reputation of the authorities who have expressed their decided opinions on this subject as experimenters and observers, it would be rash to advance the statements here made as being opposed to their own views. It is unquestionably true, however, that the evidence here given must be considered as demonstrating that *in this form of vacuum tube the X-rays radiate in all directions from the surface first encountered by the cathode rays*, and that they do not start from the anode.

Fig. 1 represents the vacuum tube. It is made of German glass tubing, 4 cm. in diameter and 8 cm. long. One end is drawn out, and an aluminum electrode terminating in a disc is inserted at A. A second is inserted in the side, at C, and is enclosed in a thick piece of glass tubing, to prevent any radiations from it reaching either A or B.

The end B has a flange which is ground to receive a ground plate of aluminum B. This plate is 3 mm. thick, except at the center, where it is ground away to a thickness of about one-tenth of a millimeter. The joint was made by melting shellac (containing a small quantity of rubber) around

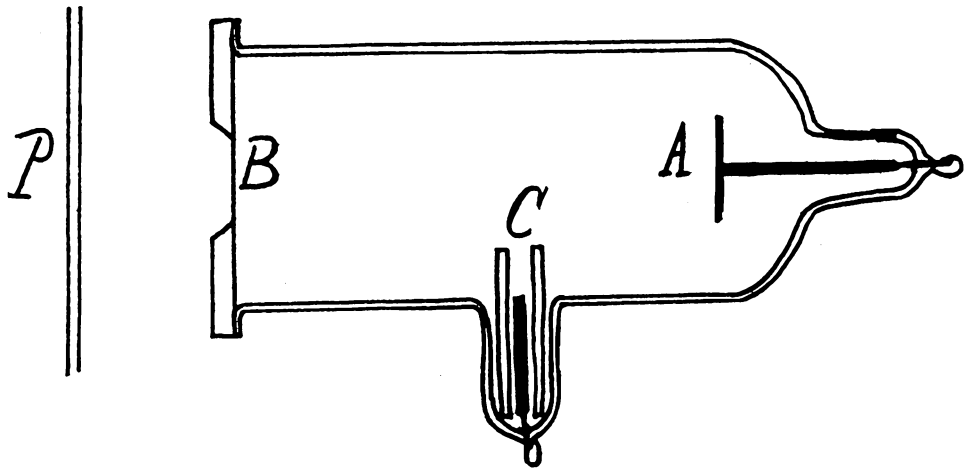

FIG. 1.

the outside. This joint was found to hold so well that the discharge frequently passed through the air (about 5 cm.) outside the tube.

A photographic plate in its plateholder was placed at P, about two centimeters from the aluminum plate B. The experiments were as follows:

1. A was made the cathode and B the anode. The resulting photograph is given in Fig. 2. It shows that the X-rays radiate in all directions from the thin portion of the B.

2. B was made the cathode and A the anode. The resulting photograph is given in Fig. 3. It shows that the X-rays radiate

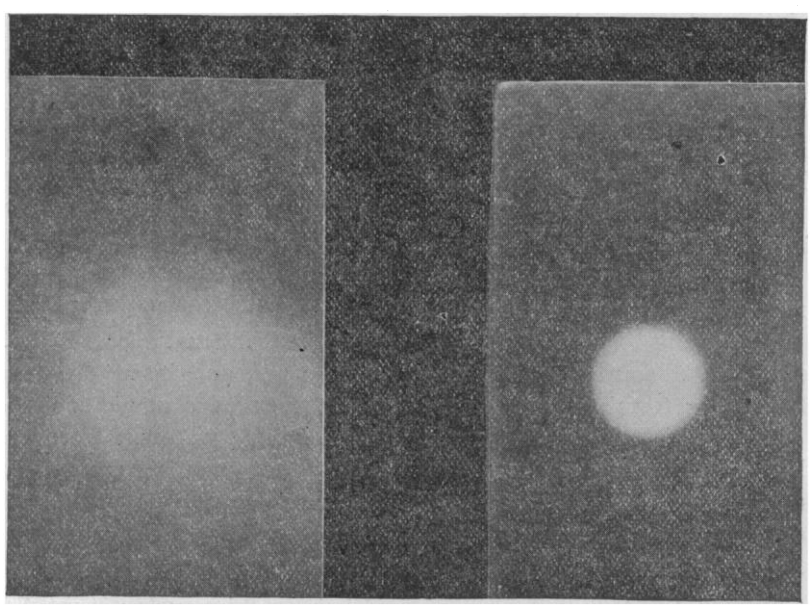

FIG. 2.

FIG. 3.

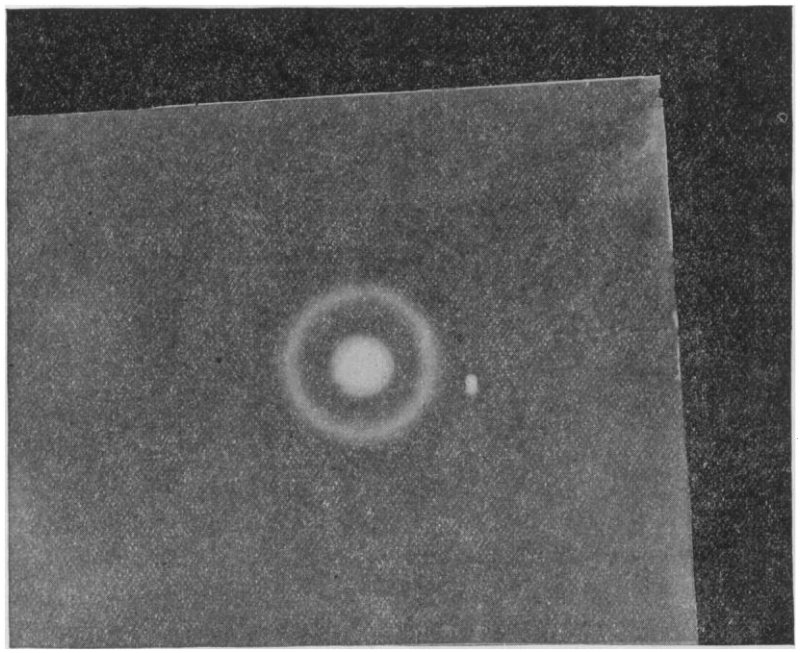

FIG. 4.

from A and cast a shadow, moderately well defined, of the plate B.

3. B was made the cathode and C the anode. An iron washer was placed in contact with the thin aluminum window at B. The resulting photograph is given in Fig. 4. it shows that the X-rays radiate from A exactly as in (2), casting a shadow of the aluminum disc and the iron washer in front of it.

Now, while it is possible to explain experiments (1) and (2) by considering that the X-rays radiate from the *anode*, no such explanation will account for experiment 3, in which the undoubted source (A) was unconnected with either terminal of the secondary coil which furnished the discharge.

On the other hand, not only are all three experiments consistent with the statement given above, but the origin of the X-rays at the place where fluorescence is excited on the glass walls of the common form of Crooks tube is also thereby accounted for.

While it may be true that the effects may be enhanced by making the anode the first object encountered by the cathode rays, the result of these experiments is to show that the anode does not play an important rôle in the phenomenon.

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CURRENT STUDIES IN EXPERIMENTAL GEOLOGY.

THE COLOR OF WATER, AS AFFECTED BY CONVECTIONAL CURRENTS.

PROF. W. SPRING, of Liège, has just added a new and interesting contribution* to our knowledge of the causes of illumination of deep waters. Pure water is actually blue when seen through sufficient thickness. Spring showed in 1883 that perfectly colorless particles in suspension would form a turbid medium, giving passage to

* Arch. des Sciences phys. et nat. Geneva, March, 1896.